



**Infectious Disease Epidemiology Section**  
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## ***ERYTHEMA INFECTIOSUM (EI)*** **PARVOVIRUS INFECTION**

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*Erythema infectiosum*, commonly known as fifth disease is a mild, usually nonfebrile erythematous eruption occurring as an epidemic among children.

Parvovirus B19 is the cause of the fifth disease of infancy or *Erythema infectiosum (EI)*. Parvovirus B19 is a single stranded DNA virus belonging to the *Parvoviridae* family of viruses, which includes a number of animal parvoviruses such as the canine parvovirus and feline panleukopenia virus. Parvoviruses are species specific and B19 is the only known pathogenic human parvovirus.

### **Epidemiology**

The only known hosts to the virus are humans.

The primary mode of transmission is believed to be by droplet infection or from person to person by direct contact with respiratory secretions. Contact in the same room (e.g. in a house or classroom or a 2-4 bed hospital bay) for a significant period of time (15 minutes or more), or face to face contact with a laboratory-confirmed case of parvovirus B19 infection during the period of maximum infectivity in the absence of droplet isolation precautions commonly causes transmission.

Contaminated blood products have been linked to transmission after transfusions.

The infectivity period lasts from seven days prior to appearance of a rash up to the date of appearance of the rash. Patients with EI are most infectious before the onset of illness and unlikely to be infectious when the rash finally appears, however cases with aplastic crisis are contagious from before the onset of symptoms up to a week after.

The transmissibility of the virus to adults is relatively low. In elementary school employees annual seroconversion rates have been reported at around 5% including epidemic years. Even in household settings where level of contact is intense, attack rates are only around 50% among susceptible household members. In the healthcare setting the estimate of attack rates is only 33%. This estimate comes from in-patient settings during outbreaks amongst staff who may have had prolonged, frequent and close contact with cases.

EI infections occur sporadically or during community outbreaks. Up to 50% of susceptible household contacts will develop secondary infection.

### **Individuals at high risk are:**

- Women up to 20 weeks of pregnancy: Fetal loss has been estimated as occurring in 9% of pregnancies in which infection occurs during the first 20 weeks and hydrops fetalis in 3% of pregnancies in which infection occurred between 9-20 weeks. There is no evidence of B19 associated teratogenicity, or of

developmental abnormalities appearing later in childhood. Extremely rarely, infections after 20 weeks of gestation can be associated with transient anaemia in the mother or the newborn without sequelae.

Current understanding is that only B-19 IgG antibody negative women are at risk of fetal loss due to maternal infection. Serologic studies show that in the U.S., the adult population has a B-19 IgG antibody positivity rate of 30-60%. In addition, the risk of fetal loss due to B-19 infection, seems to be greatest in the first half of pregnancy. Mothers of school-age children and teachers are at particular risk of exposure. Available data is very limited but suggests that the risk of fetal death to a woman with B-19 infection in the first half of pregnancy is probably less than 5%. When this risk estimate is combined with the secondary attack rate of 50% in a household there is an estimated 2.5% risk of fetal death in a susceptible woman by way of exposure to a household contact. With a secondary attack rate of about 15% in the school setting, a susceptible teacher in the first half of pregnancy has an estimated risk of less than 1% by way of contact with an infected student. These figures are based on very limited data and should be considered only rough estimates at best.

- Haemoglobinopathies: Parvovirus B19 infection can cause transient aplastic crises (TAC) in non-immune patients with chronic haemolytic anaemias e.g. sickle cell disease, beta-thalassaemia and hereditary spherocytosis. The viral load is likely to be high such as when a patient is in aplastic crisis. Such patients may pose a significant risk to health care workers.
- Immunocompromised: Persistent viral replication leading to red cell aplasia and chronic anaemia has been reported in immunodeficient patients. In immunocompromised patients with chronic parvovirus infections the viral load can be low and nosocomial exposure of susceptible HCW to such patients does not necessarily carry much risk of infection.

The incubation period is generally 4-14 days but may be as long as 21 days. The presence of IgM antibody indicates recent infection.

## **Clinical Description**

The most common clinical presentation is *Erythema infectiosum* (also called fifth disease and slapped cheek syndrome). It is characterized by a facial rash which spreads to the trunk and limbs, usually preceded by a non-specific flu-like illness. *Erythema infectiosum* is clinically similar to rubella and the two diseases can only be reliably distinguished by laboratory tests. Parvovirus B19 is also associated with rheumatological manifestations which mostly occur in adults, especially women, and are characterised by joint pains and swelling. The clinical picture is of an acute symmetrical polyarthropathy, often severe, which can last for months in a small proportion of patients. Rarely, neurological and cardiac manifestations have been described. There are no symptoms in about 20-30% of infections.

## **Laboratory Tests**

In samples collected shortly after onset, or samples collected from immunocompromised patients with persistent viral replication, active infection is best demonstrated by the detection of B19 DNA. This test is not available at the state laboratory.

Recent infection is usually diagnosed by demonstrating B19 specific IgM antibody which can be detected reliably for up to two months after infection.

The State Laboratory in New Orleans performs ELISA testing for Parvovirus B19 only by special request. For questions call the State Laboratory's Virology Section at (504) 568-5374 or the Infectious Disease Epidemiology Section.

## Surveillance

EI is not a reportable condition unless it occurs in an outbreak.

## Case Definition

A probable case of *Erythema infectiosum* is defined as an individual manifesting a rash illness that is clinically diagnosed by a physician or has been epidemiologically linked to a physician-diagnosed case.

A confirmed case is a case with laboratory confirmation (see laboratory section).

## Intervention

Sporadic cases do not need investigation. Concerned pregnant women need to be counseled regarding the risk of fetal loss.

Children should be excluded from school only until other rash illnesses have been ruled out. Because of the mild nature of the illness and the fact that the period of greatest infectivity precedes the development of the rash, the possibility of measles, rubella or other rash-type illnesses should be eliminated.

Management of pregnant, susceptible women with exposure to B-19, must be based on estimations of risk and consideration of options by the pregnant woman and her physician. The most frequent occurrence is a teacher in a school where a fifth disease outbreak is occurring.

As general advice, any woman who is less than 20 weeks pregnant and has been in contact with a confirmed or suspected case of parvovirus infection during the 7 days before the rash appeared should seek medical advice. A blood test to find out whether they are susceptible to infection should be considered and further follow up if necessary.

Serial fetal ultrasound is used for the diagnosis of *hydrops fetalis*. Intrauterine fetal transfusion, which requires specialist clinical expertise, is used for the treatment of *hydrops fetalis* in some centers and has shown to improve survival.

School exposure: This advice applies equally to employees working in settings such as primary schools where the rates of parvovirus infection may be higher than in other settings. If there is an outbreak in a school, employees such as teachers who are in contact with affected children and who are less than 20 weeks pregnant should also seek medical advice.

Only during an outbreak should exclusion of employees who are less than 20 weeks pregnant and in close contact with children be considered. The employee should first find out whether or not she is susceptible to parvovirus B19. The employee should be informed that the outbreak probably reflects the situation in the community at large and that avoiding contact with children at school will not necessarily reduce the risk of infection.

**Hospital precaution and isolation:** Droplet isolation is advisable for seven days after the onset illness in hospitalized patients. However, there is a risk of nosocomial transmission from patients with transient aplastic crises (TAC) and from immunodeficient patients with chronic B19 infection. These patients should be considered infectious and placed on isolation precautions for the duration of their illness or until the infection has been cleared.

Screening: Screening of HCWs to identify those who are susceptible to infection is not justified in general, but may be felt to be important in certain specific circumstances. Specifically, laboratory workers who are to work with infectious materials known to contain parvovirus B19 virus should be screened to determine whether they are susceptible.

#### Exposure of health care workers

HCWs who work with at-risk patients and have significant contact with a confirmed case should have their serostatus determined.

A HCW who is seronegative should be excluded from further contact with at-risk patients until either the rash appears or until 15 days from the last date of significant contact with the case. The diagnosis can be confirmed or excluded serologically 21 days from the last contact. Serology can be performed when the rash appears or, if there is no clinical illness, a subclinical infection should be excluded by testing for IgG and IgM antibodies 21 days after the last contact.

If parvovirus B19 infection is confirmed in a HCW then the implications need to be considered for patients at-risk from parvovirus infection who were in contact with that HCW during the 7 days before onset of the rash.

- Exclusion of HCW: HCW should not be caring for patients when they may have an infectious disease indicated by influenza-like symptoms, a fever or rash. The exclusion of a symptomatic parvovirus B19-infected HCW may offer small practical benefit since the peak infective period will have passed by the time the rash and associated symptoms appear. However, in most cases serological confirmation of parvovirus B19 infection will not be immediately available, and the difficulty of making an accurate diagnosis on clinical grounds means that it will not be possible to differentiate between parvovirus and other illnesses which can cause nosocomial outbreaks such as rubella or measles. Therefore, a HCW who may have a parvovirus infection should be advised to stay off work until they no longer present a potential risk to patients or colleagues.
- Exposing pregnant patients
  - Overall, the risks of a pregnant woman becoming infected are greater outside the healthcare setting than within it, particularly if she has children or works with children.
  - Women who were in contact with the HCW outside the infectious period or greater than 20 weeks pregnant can be reassured.
  - Women who are less than 20 weeks pregnant, may have their susceptibility determined by testing serum for antibodies to parvovirus B19. The consent of any women whose sera are to be tested should be sought before testing. About 60% of pregnant women will be immune to parvovirus B19 because of previous infection and can be reassured that they are at no risk.
  - The 40% of women who are susceptible will not necessarily become infected after contact with another infected person as this depends on the nature of the contact. They will require serological follow-up to identify who has become infected and will then require specialist referral.
- Exposing immunocompromised patients: There is a theoretical risk of immunocompromised patients becoming infected through contact with an infected HCW although there is little evidence of this happening in practice. Some specialised units may consider staff screening to identify staff who are seropositive and hence able to care for infectious patients without presenting an infection control hazard. This might avoid having to treat each case of contact between HCW and someone with a rash as an incident of potential transmission, if this is causing excessive “fire-fighting” activity in a particular unit.

